

SFP+ MODULE: TS-SFP+-LR**SFP+ 10G SFP SM TX: 1310nm, 10KM LC (double port LC) with DDM****Compatible CISCO, ALCATEL, HP, HUAWEI, etc...****Product Features**

- Optical interface compliant to IEEE 802.3ae 10GBASE-LR
- Hot-pluggable SFP footprint
- Electrical interface compliant to SFF-8431
- 1310nm FP laser transmitter
- Advanced firmware allow customer system encryption information to be stored in transceiver
- All-metal housing for superior EMI performance Single +3.3V power supply
- Low power dissipation <700mW
- Commercial operating temperature range: 0°C to +70°C

**Applications**

- 10GBASE-LR/LW 10G Ethernet
- 1200-SM-LL-L 10G Fibre Channel
- 10G SONET/SDH
- Other optical links

General

TS-SFP+-LR 10Gb/s SFP+ transceivers are designed for use in 10-Gigabit Ethernet links up to 10km over Single Mode fiber

I. Pin Descriptions

Pin	Symbol	Name/Description	Ref.
1	VeeT	Transmitter Ground (Common with Receiver Ground)	1
2	TX Fault	Transmitter Fault.	
3	TX Disable	Transmitter Disable. Laser output disabled on high or open.	
4	SDA	2-Wire Serial Interface Data Line.	2
5	SCL	2-Wire Serial Interface Clock	2
6	MOD_DEF	Module Definition 0. Grounded within the module.	
7	RS0	Received Rate Select	
8	RX_LOS	Received Loss of Signal Indication Active Low.	

9	RS0	Trasmitter Rate Select (not used)	
10	VeeR	Module Receiver Ground	1
11	VeeR	Module Receiver Ground	1
12	RD-	Receiver Inverted DATA out.	
13	RD+	Receiver Non-inverted DATA	
14	VeeR	Module Receiver Ground	1
15	VccR	Receiver Power V3.3 Supply	
16	VccT	Transmitter Power V3.3 Supply	
17	VeeT	Module Transmitter Ground	1
18	TD+	Transmitter Non-Inverted DATA in.	
19	TD-	Transmitter Inverted DATA in.	
20	VeeT	Module Transmitter Ground	1

Notes:

1. Module ground pins GND are isolated from the module case.
2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board..

II. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage	Vcc	0		3.6	V	
Storage Temperature	TS	-40		85	°C	
Case Operating Temperature	TC	-5		+70	°C	
Relative Humidity	RH	0		85	%	1

III. Electrical Characteristics (TOP=25°C, Vcc=3.3Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Input differential impedance	Rin	90	100	110	Ω	1
Single ended data input swing	Vin, pp	180		700	mVp-p	
Transmit Disable Voltage	VD	Vcc – 1.3		Vcc	V	
Transmit Enable Voltage	VEN	Vee		Vee+ 0.8	V	
Transmit Disable Assert Time				10	us	
Receiver						
Single ended data output swing	Vout, pp	300		850	mV	2.6
Data output rise time	tr				ps	3
Data output fall time	tf				ps	3
LOS Fault	VLOS fault	Vcc – 0.5		VccHOST	V	4
LOS Normal	VLOS norm	Vee		Vee+0.5	V	4

Notes:

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. Into 100Ω differential termination.
3. 20 – 80%. Measured with Module Compliance Test Board and OMA test pattern. Use of four 1's and four 0's sequence in the PRBS 9 is an acceptable alternative. SFF-8431 Rev 4.1.
4. LOS is an open collector output. Should be pulled up with 4.7kΩ – 10kΩ on the host board. Normal operation is logic 0; loss of signal is logic 1.

5. See Section 2.8.3 of SFF-8431 Rev 4.1

IV. Optical Characteristics (TOP=25°C, Vcc=3.3 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Output Opt. Power	PO	-5	-		dBm	
Optical Wavelength	λ	1260	1310	1350	nm	
Average Optical Power	Pavg	-7	-3.5	+1	dBm	
Laser Off Power	Poff	-	-	-30	dBm	
Optical Extinction Ratio	ER	3.5	-	-	dB	
Receiver						
Average Rx Sensitivity	RSENS	-	-	-14.4	dBm	
Optical Center Wavelength	λ_r	1260	1310	1355	nm	
LOS De-Assert	LOSD	-	-	-12	dBm	
LOS Assert	LOSA	-30	-	-	dBm	
LOS Hysteresis		0.5	-	-	dB	

Notes:

1. Average optical power shall be measured using the methods specified in TIA/EIA-455-95.
2. Receiver sensitivity is informative. Stressed receiver sensitivity shall be measured with conformance test signal for $BER = 1 \times 10^{-12}$.
3. Vertical eye closure penalty and stressed eye jitter are the test conditions for measuring stressed receiver sensitivity. They are not the required characteristic of the receiver.
4. Power budget is defined as the different between the Rx sensitivity and the Tx output power of the interface.
5. Path penalty is intended as the power penalty of the interface between back-to-back and the maximum applied dispersion.

V. Mechanical Specifications

Small Form Factor Pluggable (SFP) transceivers are compatible with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA).

